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Critical Literature Review (ANTA602)

How many accidents are too many accidents? Tourism Safety in Antarctica

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Abstract:

In recent years there have been several accidents related to tourism in Antarctica, and the risks are continuing to escalate. There is potential for a catastrophe for the passengers involved, the rescuers, the research projects being performed, and the Antarctic environment.

However, there doesn't appear to be much research focused on prevention. Just what is being done to prevent further world headlines about Antarctic accidents such as those on Explorer, M/S Nordkapp, Lyubov Orlova, M/S Fram, M/S Ushuaia and M/S Ocean Nova?

What actions are being taken to prevent further loss of life like those on the yacht Berserk?

This literature review surveys the information and research which is publicly available and which addresses the subject of safety in Antarctica. In the last decade human activity in Antarctica has increased substantially. Although some actions have been taken through co-operative agreements to limit the risks this creates, these actions have been partial and non-binding to many countries, individuals and enterprises. This review establishes that despite escalating risks, no urgent action has been undertaken to develop binding protocols for Antarctic expeditions.

The cruise ship 'Explorer'



Photo: Fuerza Aerea de Chile,
via European Pressphoto Agency

Passengers from the ship 'Explorer'



Photo: Michael S. Nolan / Lindblad Expeditions,
via Associated Press

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Background:

Antarctica is considered the last unexplored continent; it holds a special fascination for both researchers and tourists alike. Some voyages to Antarctica are undertaken to enable National Antarctic Programs (NAPs) to carry out logistics support for scientific research, whilst other voyages are for Antarctic tourism. However, as is inevitable in such an extreme, remote place accidents have occurred, and will continue to occur. What can be influenced is the scale and impact of future accidents through binding protocols regarding safety, emergency responses, equipment standards and environmental hazards.

Whilst the NAPs work together to implement policies to minimise danger and incidents, they do not have the same level of authority to enforce these measures on tourism operators, due to the fact that Antarctica is not a country, but rather an area that is managed by The Antarctic Treaty (Treaty).

Of the 193 countries in the world, only 50 countries (Secretariat of the Antarctic Treaty, 1959) are signatory to the Treaty, with the remaining countries not officially recognising it. Therefore the citizens of those countries who have not signed up to the Treaty are not breaking any laws in their own country if they do not abide by the Treaty, or by the rules put in place by NAPs for Antarctica.

Furthermore there is no reference to tourism or how it should be managed within the Treaty (Antarctic Treaty Secretariat, 1959). However, should tourists be in danger it is often the NAPs that have to rescue them, thereby risking their own lives and their research, while simultaneously trying to minimise risk to the pristine Antarctic environment.

In the absence of laws, or any mention of tourism within the Treaty, an organisation known as the International Association of Antarctic Operators (IAATO) was formed in 1991 by 7 Antarctic tourism companies (IAATO). Today they have over 100 members, which include most of the Antarctic tourism operators.

The IAATO plays a significant role at an international political level, representing the tourism operators at conferences such as the Antarctic Treaty Consultative Meeting (ATCM). They also produce information such as guidelines, training, statistics and operations manuals for their members and the

general public. It is believed that IAATO has performed an 'admirable job', as reported by the United States (United States, 2007). It also seems that the tourism industry would not be at the maturity level they are today, if it had not been for the continual actions of self-regulation taken by IAATO. This level of maturity has had and will continue to have a positive impact on reducing the risks of tourism incidents within Antarctica and the surrounding oceans.

Critical Review:

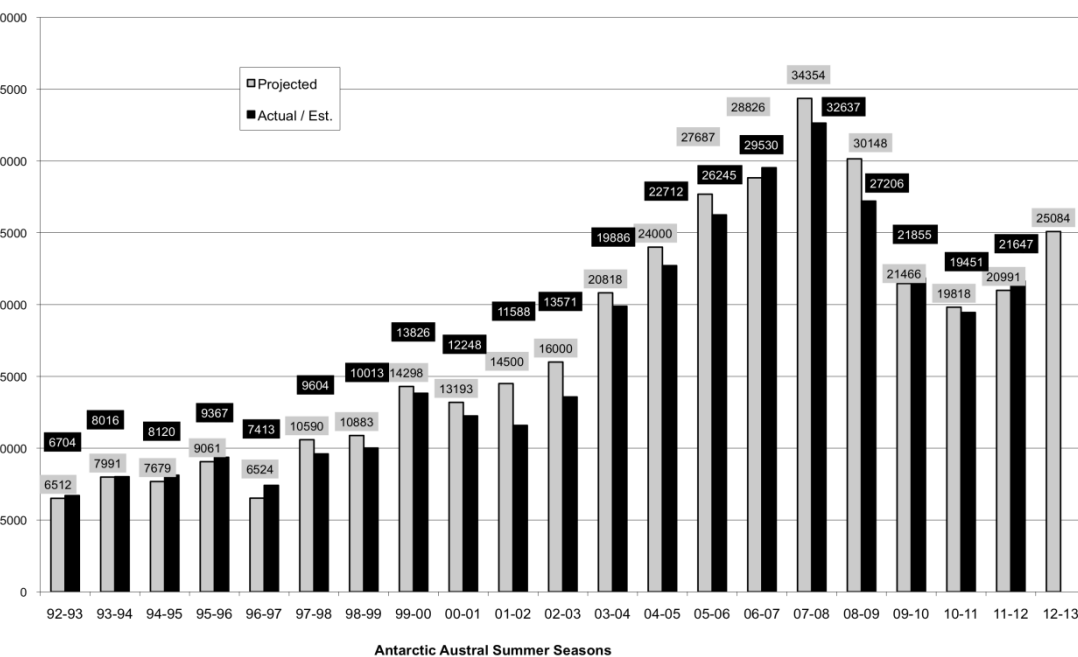
Antarctic Tourism is not a new phenomenon, it has been occurring in Antarctica since before the Treaty was signed (Tracey, 2001, p. iv), however it has been an ongoing matter of concern for the National Antarctic Programs since at least 1966, where it was first tabled as an agenda item at the 4th ATCM (Secretariat of the Antarctic Treaty, 1966).

The purpose of this review is to identify what work has been completed to date to prevent or minimise accidents, and what improvements are continuing to be made.

The first and largest overall cause for concern for the National Antarctic Programs is the significant increase in volume of passengers visiting Antarctica. The reason for this concern is that with more people visiting there is both a greater chance of small-scale incidents and also of an incident involving a large group of tourists that the NAPs do not have the facilities, or expertise locally available to manage.

The accuracy of the concern over tourism growth can be evidenced by statistics from IAATO (refer Figure 1 below) showing that tourism has grown from 6701 passengers in 1991 -1992 season, to 26,509 passengers in 2011-2012 season. It should also be noted that prior to the Global Financial Crisis the passenger numbers reached as high as 46,069 in 2008 (IAATO), and that the estimates for 2012-2013 are 34,950. (IAATO, 2012)

Figure 1 - IAATO actuals versus projected tour figures in Antarctica 1992 - 2013



The ATCM in 2004 (Secretariat of The Antarctic Treaty, 2004) made a significant effort to address the tourism situation by attempting to put in place the following policy measure:

- that appropriate contingency plans and sufficient arrangements for health and safety, search and rescue (SAR), and medical care and evacuation have been drawn up and are in place prior to the start of the activity. Such plans and arrangements shall not be reliant on support from other operators or national programmes without their express written agreement; and
- that adequate insurance or other arrangements are in place to cover any costs associated with search and rescue and medical care and evacuation.

However, as of April 2007, only 3 countries had approved the measure. The United States raised the above measure again at the 2007 ATCM (United States, 2007), explaining that they are still in the process of developing their local legislation, to enable them to approve this measure. They then requested that other Antarctic Treaty Consultative Parties (ATCP) also keep working to enable their own governments to approve this measure.

As at December 2012, this measure has still not been approved by 16 of the 27 ATCPs. All 27 ATCPs are required to approve this measure before it comes into effect.

Getting this measure approved, in consideration the spate of ship accidents that have occurred from 2006 onwards, can only be seen as a very high priority. Recent accidents include: November 2006 the Lyubov Orlova grounded on Deception Island; January 2007 MS Nordkapp ran aground just off Deception Island this resulted in the spillage of marine diesel oil but fortunately had limited environmental consequences; November 2007 saw the Explorer hit ice and sink; December 2007 – the ship MS Fram lost engine power and drifted into an iceberg; (Robertson, 2008), the M/S Ushuaia, and the M/S Ocean Nova (Liggett, 2011). The potential expense and risk of lives involved in having to send out NAPs or Search and Rescue (SAR) to assist with these accidents can only be condemned.

To provide further evidence Appendix 2: Incidents relating to Antarctic tourism; summarises incidents and accidents which have occurred between 1967– 2003 (excluding medical emergencies). Of interest is Liggett's reference to not being able to locate data between 2004 –2007. However, after the Explorer sinking accident in 2007, reporting of accidents has resumed.

The United States submitted a further working paper in 2008 which documented well thought out practical requirements that would need to be put in place to minimise further accidents. (United States, 2008). However, the minutes of the conference (Secretariat of the Antarctic Treaty, 2008), show that the suggested requirements were downgraded into areas of future investigation by assorted groups. The details follow:

- Tendering on Zodiacs and rescue boats was handed over to the International Maritime Organisation (IMO) for investigation; along with lifeboat requirements,
- The intercessional contact group would continue to work on risk analysis prior to handing over additional activities to expert groups,
- No responsibility was assigned for further improving navigational data,
- The Committee for Environmental Protection (CEP) was invited to review ways in which data could be collected to review impacts of tourism activities.

In the absence of any other literature on the above matter, it can be argued that the above outcome is a disappointing one. No central body was assigned to co-ordinate the investigations detailed above, or to ensure that the above activities would be executed, let alone quickly, given the high priority that they require. Furthermore, the United States had submitted further practical suggestions in their Working Paper, which according to the meeting minutes had no actions assigned to them.

This is one of the highest risk topics in Antarctica, both from an environmental and human risk angle; and yet even with the sinking of the ship Explorer in the past 12 months as a 'wake-up call', the importance of this matter appears to have been lost at this meeting.

This outcome is a loss for the National Antarctic Programs, the Antarctic Tourism companies, and the countries surrounding Antarctica who will all have to continue to be involved in future Search and Rescue activities, thus putting their own and other people's lives at risk - for situations that could have been prevented by this meeting.

Ship based tourism would have to be considered one of the most dangerous forms of tourism due to the number and density of people on board, the higher frequency of the tours occurring, the older age groups of the passengers, and the risk of being stranded in near freezing water, with potential -10c to -30c whiteout storm conditions.

Cruise tourism has now hit a critical point in light of the evidence showing the incidents of the last 5 years. For instance, "between 2007 and 2009 four tourist vessels were grounded and one sank in the

Antarctic Treaty area. Indeed the sinking of the ship Explorer in 2007 was a wakeup call to the Treaty Parties” (McCully, 2009, p. 40). The Explorer was the most significant ocean accident to have occurred to date, and was covered by media around the world. The Explorer had 100 passengers, and 54 crew on board, when it sank on 23 November 2009. Luckily, all passengers were rescued and transferred to the NordeNorge ship which was close by (Kesselly, 2009).

However if that ship had been one of the “large tour vessels capable of carrying more than 4,000 passengers and crew” (United States, 2007), the NordeNorge ship wouldn’t have been able to cope with the sheer volume of passengers and potential injuries, hypothermia or deaths that may have occurred. As Jon Bowermaster asked: “Who would rush to the rescue of several thousand lifeboat-bound passengers during an Antarctic storm?” (Bowermaster, 2007)

As many people have noted, “fortunately no one was lost in the Explorer incident, but the fact that there have not been more serious consequences owes more to good luck than good management” (McCully, 2009, p. 40).

As the largest risk in Antarctica appears to be the sinking and loss of lives of people on larger ships (ie holding 500+ people), and based on evidence of the Explorer ship sinking, an appropriate short term action at the 2008 ATCM could have been to at least put an immediate temporary ban on ships with a 500+ passenger capacity entering Antarctica until a more permanent solution could be agreed. However this opportunity to address this largest of risks appears not to have been discussed, despite the specific situation being raised at the 2007 ATCM by United States (United States, 2007).

The only measure that has come along to minimise safety risks is one that was actually implemented as an environmental solution by the International Maritime Organisation (IMO), which bans the use or carriage of Heavy Fuel Oil (HFO) in Antarctica.

Shipping nations around the world are increasingly concerned about the risks faced by vessels sailing south of 60 [degrees latitude], especially given the rapid increase in the number of people visiting

Antarctica by sea and the number of recent incidents involving tourist vessels in Antarctica. (Taylor, 2009)

These very serious incidents have highlighted to [Antarctic] Treaty [Consultative] Parties and the IMO how vulnerable these ships are to the hazards of ice, extreme weather, isolation and limited charting as they sail these waters. These factors work together to endanger passengers and crew, and also increase the risk of environmental harm should there be a shipping casualty. (Taylor, 2009, p. 36)

The HFO ban has caused much debate in the tourism and shipping industries regarding the impact it will have on tourism, in particular the ships that can take 500+ people on them, of which the majority currently use HFO.

However, the Antarctic and Southern Ocean Coalition (ASOC) believes “that this ban will impact only a small segment of the Antarctic cruise industry, yet will provide immeasurable and invaluable protection for this pristine and fragile region” (ASOC, 2009, p. 4). Conversely, according to IAATO;

4,872 passengers travelled on 5 voyages aboard 500-plus-passenger vessels operating “cruise-only” voyages, making no landings in the Antarctic Treaty Area. This is a marked decrease from the 14,373 passengers and 10 cruise-only voyages during the previous 2010-11 season, and as mentioned above, is due to the ban on the use and carriage of HFO coming into force. (IAATO, 2012)

IAATO were actually in a no-win situation in this scenario, because normally (as per their mission statement) they “advocate, promote and practice safe and environmentally responsible private-sector travel to the Antarctic” (IAATO), and therefore would have promoted it. However on this occasion it meant that if they supported it, they were directly removing business from their clients with 500+ passenger ships. Whilst at the same time by supporting it, they would have been providing new business to their clients (competitors) with smaller ships, by providing them with the passengers who would have previously sailed on a larger ship.

Comparing the above two statements of ASOC and IAATO, and remembering that the overall focus of Antarctica is to keep it pristine, the author believes that the HFO ban is aligned with The Antarctic Treaty, Article IX, 1.f, “preservation and conservation of living resources in Antarctica” (Antarctic Treaty Secretariat, 1959). Therefore banning the use or carriage of HFO was the most suitable outcome.

Regarding the earlier issue of the risk of cruise ships with 500+ people getting into trouble in Antarctica; this HFO ban, by co-incidence, has provided some additional risk mitigation by helping to minimise the number of large ships which come into Antarctica, and may need search and rescue assistance.

Conversely, placing a ban on HFO does not remove the risk altogether, as some of the larger ships do not require HFO. The United States believes that:

“Given the potentially catastrophic human and environmental consequences of an accident, vessels with a capacity of more than 500 passengers should be subject to special construction standards beyond the redundancy in propulsion and other essential systems prescribed in the IMO’s Passenger Vessel Safety Initiative. (United States, 2007)

Safety for tourism operators isn’t just the responsibility of the National Antarctic Programs. It also belongs with IAATO and the actual tour operators.

As the tourism operators’ reason for being in business is to make a profit and grow their business by taking tourists to Antarctica, then the responsibility for the safety of humans, the environment (which is what their visitors come to see), the transport and the accommodation they provide should be their primary focus.

To assist in this, the IAATO website (IAATO) outlines the protocols which all staff and crew of tourism ventures and non-government initiatives should follow, as per Recommendation XVIII-1, adopted at the ATCM, Kyoto, 1994.

The IAATO website includes information on: providing advance notice and receiving approval from national authorities, being fully conversant with emergency procedures, considering appropriate insurance, preparing contingency response plans, and on employing experienced and trained personnel. The website also details the use and operation according to appropriate procedures of equipment, vehicles, vessels, and aircraft which are appropriate to Antarctic operations, including those set out in the Antarctic Flight Information Manual.

In order to minimize risk, IAATO tour company members are also required to “screen” all passengers before accepting them on tours. (IAATO, 2003)

Additionally, IAATO ensures that member companies are sufficiently insured, and that they are capable of dealing with incidents without being overly reliant on facilities and support from uninvolved national programs. The network of IAATO member companies active in the Antarctic region, and the pre-established contacts with NAP's, anticipates this need. (Lamers, 2009)

The other main avenue for preventing or minimising incidents is through tourism operators having contingency arrangements in place with Adventure Network International (ANI) / Antarctic Logistics and Expeditions (ALE).

ANI is an adventure tourism organisation, owned by ALE, and between these two organisations, they provide both the majority of land-based expeditions, and support in Antarctica. They also provide support services for NAPs and research projects.

ANI/ALE includes safety as a core focus within their own business through search and rescue capability, additional supplies so they are self-sufficient, by providing their own doctor and basic clinic, and by requiring all passengers to have adequate evacuation insurance. (Adventure Network International). Furthermore they have additional safety mechanisms required for all expeditions, including 24-hour phone coverage, satellite phones and beacons. ANI have a policy of “no contact for 48 hours stimulates a rescue response” to help ensure the safety of their clients. (Adventure Network International)

There appears to be no literature criticizing either IAATO or ANI/ALE, and therefore it would be a fair assessment to say that both IAATO and ANI/ALE make tourism safety a key priority in their business, and that they work hard to meet and maintain all safety guidelines for tourism operations in Antarctica.

Unfortunately, however, not all individuals or groups have a level of commitment to regulations, safety or the environment; and from time to time 'unprofessional thrill seeker' tourism is attempted which in an attempt to 'perform their own expedition', ignores both the authorisations required and the safety guidelines..

On several occasions such expeditions have ended in trouble and, possessing no prior arrangement, have needed search and rescue services from NAPs,. A recent example of this is the 2011 "Wild Vikings" expedition led by Mr Jarle Andhøy, a Norwegian reality television personality earning approximately \$1 million USD. This expedition ended in a week-long search and rescue mission for his ship Berserk, which culminated in the loss of three of the Berserk's crew members' lives (New Zealand, Norway, United States, 2011). The outcome of Andhøy's action was a fine of a NOK 25 000 (~5000 USD) fine, which he agreed to pay (Norway, 2012).

Subsequently in 2012 Mr Andhøy attempted a second similar expedition; again without any of the appropriate authorisations (New Zealand, 2012), (Norway, 2012), (Chile, 2012). Again his expedition was unsuccessful.

The NAPs are in a difficult situation, as it is their governments' staff, funding, and research projects that are put at risk every time a search and rescue (SAR) mission is required. Therefore, particularly in the last decade, the ATCM has also regularly stressed its 'own responsibility' to address tourism-related concerns (Netherlands, 2012), such as the example above, and those in Appendix 1: Incidents during Antarctic adventure tourism

Conclusion:

The Antarctic tourism industry has made significant progress over the last 20 years in minimising risks to human life, to the environment, and to scientific research in the Antarctic. This has been achieved by IAATO and its members being self-regulating and implementing and maintaining their own policies. It is also recognised that this work could not have been achieved, had the Antarctic Treaty System not allowed IAATO to become closely involved at the highest international level of meetings and decision-making. The outcomes achieved have been a win-win for both the ATS and IAATO.

However, there are still many more improvements which need to be made in order to reduce the number and impact of further incidents, and these can only be implemented by the ATCP. For instance, changing the ship design requirements for Antarctica will involve the IMO. Determining the maximum volume of passengers aboard will depend on various governments search and rescue commitments and capabilities; and putting in place laws and corresponding serious consequences will be required to deter 'unprofessional thrill seekers' from putting NAP, tourism operators, and search and rescue teams lives at risk. Once these improvements are in place, it will then be easier for tourism to also help protect both the environment and the scientific research being performed in Antarctica.

Further Research:

This literature review identified that Cruise Tourism appeared to be one of the largest risks within Antarctica, due to both the human and environmental risks that could occur with shipping accidents.

One of the most significant ways to help minimise this risk would be to set a maximum quota of combined passengers and crew/staff per ship (for instance 500).

It would also be beneficial to determine the minimum structural requirements for a ship. The report from Liberia regarding the sinking of Explorer, referenced how ship structure calculations for Ice ability towards ships has changed, however ships retained their original designation, and weren't updated when the new standard came in. This has the serious potential to cause confusion for future researchers, as well as tourists when investigating which ship to travel on.

A review of current ships that visit the Antarctic and Arctic, and a comparison of them each against the new standard would be valuable to see where they all now align. It would also be advantageous to have this compared against what volume of passengers /crew the ship can hold.

This would then provide an accurate understanding of what ships are entering the Antarctic and Arctic, what their capabilities are.

This research could then help to identify just how high the risks are, and what can possibly be done to manage these risks. For instance the outcome may be modification of some of the ships, or recommending they are banned from travelling to Antarctica or the Arctic.

This research would provide a very valuable insight for the National Antarctic Programs that are trying to prevent a potential human and environmental catastrophe from occurring.

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Please Note: The dates in this bibliography are in US Date format, as per the APA Style Guide.

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Appendix 1: Incidents during Antarctic adventure tourism

Figure 2 - Incidents during Antarctic adventure tourism

The following table provides a summary of Antarctic adventure tourism expeditions in 2000-2005 that have caused concern. (Lamers, 2009, pp. 85-86)

Season	Incidents
2000/01	<p>In 2001 Rolf Bae and Eirik Sonneland, two Norwegian adventurers, arrived at Scott Station (New Zealand) after a 2.900 km, 107 day, unsupported skiing trek from Troll Station (Norway) in Dronning Maud Land to Ross Island. Bae and Sonneland started off after wintering at Troll Station with no formal arrangements on transport, or SAR. They were not able to communicate their circumstances and position because of failing communication equipment. Furthermore, they surprised everyone by taking off for Ross Island after arriving at the South Pole, since this was not in their initial plans. They arrived at Ross Island with little food and were accommodated and fed at Scott Station. They were able to leave Antarctica on a tour vessel (ANAN Archive, 2001: 41/02).</p> <p>In the same season, two Australian adventurers Peter Bland and Jay Watson ran into difficulties in an attempt to cross the Antarctic Peninsula after Bland was injured in an avalanche. Despite the negative advice while obtaining permits from by the Australian authorities, Bland and Watson chartered a private yacht and set off for the Peninsula. The activities involved in this Antarctic Peninsula trek included kayaking, mountain climbing and skiing. It took the combined efforts of the yacht's crew, a nearby tour ship and the Chilean national program to save Bland in a very difficult and dangerous rescue attempt. Bland and Watson had no official permit for their expedition and no formal SAR plan (ANAN Archive, 2001: 41/01).</p>
2001/02	<p>In 2002 a group of Russian government officials and tourists traveling with Cerpolex, a French company, were stranded for two days at the South Pole because their aircraft failed to start. They were accommodated and catered for at Amundsen-Scott Station (USA) and eventually flown out at their own expense (ANAN Archive, 2002: 79/05). In 2005, their aircraft, an Antonov -3, was successfully recovered by combined efforts of the USA and Russia.</p>
2002/03	<p>In 2002 the French pilot Henri Choroze made an unexpected emergency landing on Marion Island (off the coast of DML) in an attempt to become the first to fly around the world via both poles in a single-engined aircraft. After a hard landing, Choroze was quickly pulled from his aircraft by a South African rescue team. He stayed at Marion Island (South Africa) for ten days, then was transported off the island by a French naval vessel (ANAN Archive, 2002: 88/01).</p> <p>In early 2003 a UK-registered helicopter crashed into the ocean near the South Shetlands in the Antarctic Peninsula. The Chilean navy rescued two British pilots from a life raft. Apparently the British authority was not aware of this expedition prior to the incident (ANAN, 2003: 93/03).</p> <p>A few days later a scuba diver died while making a check dive with the Netherlands-based tour company Oceanwide Expeditions. The victim was part of a group of nine Latvian scuba divers on board the tourist vessel Gregory Mikheev. Despite the resuscitation attempts by the ship's doctor and the help offered by a nearby Brazilian research ship; he died (ANAN 2003: 91/02).</p>

Figure 3 cont. - Incidents during Antarctic adventure tourism

Season	Incidents
2003/04	<p>British pilot Polly Vacher had to abort her attempt to cross the Antarctic by aircraft because of bad weather conditions. She had made several arrangements with the national programs of New Zealand and the UK and a tourist vessel for services (ANAN Archive, 2002: 64/11). The expedition was cancelled (IAATO, 2004b: 21).</p> <p>Australian aviator Jon Johanson landed at Ross Island after having become the first person to fly across the South Pole in a homemade aircraft. He had no fuel left to return to New Zealand and eventually got a refill from the Vacher expedition's fuel dump that was stored at McMurdo station (USA) (New Zealand and United States, 2004) (IAATO, 2004b).</p> <p>British helicopter pilots Jennifer Murray and Colin Bodill planned to circle both poles when their helicopter crashed near Patriot Hills. They were rescued by ANI/ALE according to their contingency plans (IAATO, 2004b).</p>
2004/05	<p>In early 2005, UK sailor Stephen Thomas died after falling into a crevasse near Port Lockroy in the Antarctic Peninsula. Thomas and his crew reached Antarctica by private yacht after having previously sailed to the Arctic region. Despite his considerable experience in mountaineering, Thomas was unaware of the specific Antarctic conditions. He was retrieved by his yacht crew and examined by a medical doctor on a nearby cruise ship and pronounced dead (BBC News, 2005; IAATO, 2005c).</p>

Appendix 2: Incidents relating to Antarctic tourism

Below is a combined summary of recorded accidents and incidents (Liggett, 2011) relating to Antarctic Tourism.

Figure 4 - Overview of recorded accidents and incidents from 1967- 2003

Table 1
Overview of recorded accidents and incidents from 1967 to 2003.^a

Date	Vessel/aircraft	Tour operator/party involved	Occurrence
14-Feb-67	<i>Lapataia</i>	Lindblad Travel	26 tourists stranded on Half Moon Island
1-Jan-68	<i>Navarino</i>	Lindblad Travel	Steering engine failure
22-Jan-68	<i>Maggie Dan</i>	Lindblad Travel	Ship ran aground off Hut Point, McMurdo Sound
22-Jan-69	<i>Aquiles</i>	Lindblad Travel	Approximately 70 tourists stranded at Palmer station
23-Jan-70	Piper Aztec Twin Engine	Max Conrad (US)	Plane crashed during take off at South Pole, pilot survived
24-Dec-71	<i>Lindblad Explorer</i>	Lindblad Travel	Ship grounded in Gerlache Strait, tourists rescued by Chilean Navy
11-Feb-72	<i>Lindblad Explorer</i>	Lindblad Travel	Ship grounded on rocks in Admiralty Bay, King George Island
29-Nov-72	<i>Ice Bird</i>	David Lewis	Second capsizing of yacht, later reconstructed at Palmer station in 1973
1973	<i>Libertad</i>	DNT/ELMA	Damage to ship
28-Nov-79	DC-10 Flight 901	Air New Zealand	Plane crash on Mt. Erebus, Ross Island, no survivors among the 257 passengers and crew
24-Dec-79	<i>Lindblad Explorer</i>	Lindblad Travel	Ship grounded on rocks off Wiencke Island
31-Dec-85	Aircraft	Chilean Tourist Flight	Plane crash on King George Island, all men on board killed
10-Jan-86	<i>Southern Quest</i>	"In the Footsteps of Scott" expedition	Ship crushed by pack ice, 21 crew members rescued by US helicopters from McMurdo, ship sank 4 miles east of Beaufort Island
28-Jan-89	<i>Bahia Paraiso</i>	Argentine Government supply/tourist ship	Ship ran aground off Anvers Island then sank leaving 600,000 L of fuel
1-Feb-91	<i>Pomorie</i>	Marinsular	Ship grounded in Jones Sound
26-Nov-93	DC-6B aircraft	Allcair	Crashed 9 miles from Patriot Hills Base Camp, 8 people evacuated by ANI
21-Jan-91	<i>World Discoverer</i>	Society Expeditions	While approaching Cape Evans/Ross Island the vessel grounded on an uncharted rock
24-Jan-96	<i>Professor Mulanovskiy</i>	Marine Expeditions Inc	Vessel grounded on rocks WNW from Penguin Island
4-Jan-97	<i>Professor Khromov</i>	Quark Expedition/Supernova Expeditions	Vessel grounded on shoal, uncharted rock in Neumayer Channel
18-Jan-97	<i>Akademik Sergei Vavilov</i>	Marine Expeditions (operator); Supernova/Quark Expeditions (charterer)	Oil Spill: Oil was observed leaking from the vessel in the Pleneau/Hovgaard area
3-Feb-99	<i>Hanseatic</i>	Hapag Lloyd	Transport Incident – starboard propeller sustained damage in Paradise Bay
31-Dec-99	<i>Clipper Adventurer</i>	New World Ship Management Co LLC/Clipper Cruise Line (operator); Zegrahm Expeditions (charterer)	While at anchor the vessel came in contact with ice damaging 2 of the 5 blades on the port propeller near Seymour Island
1-Feb-00	<i>Clipper Adventurer</i>	New World Ship Management Co LLC/Clipper Cruise Line	Vessel was beset in pack ice while navigating in Martha Strait
1-Feb-00	<i>Akademik Sergei Vavilov</i>	Quark/Supernova Expeditions	Collision with humpback whale, whale injured, when approaching Dallmann Bay
28-Dec-01	<i>Vista Mar</i>	Gauss mbH	Oil Spill: Port propeller damaged during manoeuvring in Hope Bay; Gland oil (<1l) leaking into the sea
18-Jan-02	<i>Professor Molchanov</i>	Oceanwide Expeditions (operator); Quark Expeditions (subcharterer)	Vessel nudged an iceberg, which damaged the bow bulwark
Oct. 2002	<i>Basler 67</i>	Adventure Network International	Damage to aircraft while tied on runway (Patriot Hills)
17-Nov-02	<i>Explorer</i>	Abercrombie and Kent Explorer Shipping	Generator/alternator failure causing several electrical problems
22-Nov-02	<i>Clipper Adventurer</i>	Clipper/New World Shipping	A strong wind blew the vessel onto the sandbar in Whalers Bay, Deception Island
13-Feb-03	<i>Marco Polo</i>	Orient Lines	Grounding of vessel due to weather and mechanical problems at Half Moon Island

^a Based on Headland (1992, 2005), IAATO (2000, 2002, 2003) and Reich (1980).

Appendix 2: Terms or Acronyms – Definitions

The following acronyms and terms have been used within this document.

Table 1: Terms or Acronyms and their definitions

Term or Acronym	Definition
Country Name	Each Country listed within this document is an Antarctic Treaty Consultative Party (ATCP)
ALE	Antarctic Logistics and Expeditions
ANI	Adventure Network International (owned by ALE)
ASOC	Antarctic and Southern Ocean Coalition
ATCM	Antarctic Treaty Consultative Meeting – Every country listed in this document attends the ATCM.
ATCP	Antarctic Treaty Consultative Party - Every country listed in this document is an ATCP
ATS	Antarctic Treaty System
COMNAP	Council of Managers, National Antarctic Program
HFO	Heavy Fuel Oil
IAATO	International Association of Antarctic Tour Operators
IMO	International Maritime Organisation
NAP	National Antarctic Program – Every country listed in this document has a NAP performing logistics and research in Antarctica.